Space Weather Forecast

Issued on Sunday, 15 January 2023 at 01:29 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further M-class flares and R1/R2 radio blackouts expected. Possible CME currently affecting the Earth.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate with a Moderate flare from a region in the east early in the period, and then two further Moderate flares from a large region in the southwest quadrant later in the period. This region in the southwest is one of three highly magnetically complex regions on the visible disc, with two further region close to centre disc in the northern and southern hemispheres respectively. In total there are 13 classified regions on the disc, with a number of these close to the eastern limb, where they are difficult to analyse due to an oblique viewing angle. However increasing complexity is becoming discernible from these regions. A number of weak unipolar or bipolar regions are also evident on the solar disc. A CME (coronal mass ejection) which was observed leaving the vicinity of large region in the southwest around the time of the two Moderate flares will be analysed once sufficient imagery becomes available, but the lift-off location suggests a possible Earth-directed component.

Solar Wind / Geomagnetic Activity: Solar wind speeds spent much of the day declining, but showed a small increase at the end of the day. This is possibly due to the arrival of a weak CME with the total magnetic field strength also showing a slight increase from weak to moderate levels later in the day. The north-south component was weakly positive until the suspected CME arrival, but has been predominantly negative since, reaching moderately negative levels for a time. Geomagnetic activity started Active, but reduced to Quiet to Unsettled levels.

Energetic Particles / Solar Radiation: Solar radiation has been at background levels throughout the day.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to continue at Low to Moderate levels through the next four days, due to three large and magnetically complex regions on the visible disc. There are also a number of regions on the far east of the visible disc which could present an increasing risk during the forecast period. A chance of strong flares is possible throughout
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Solar Wind / Geomagnetic Activity: A weak CME, perhaps from 11 January, appears to be affecting the Earth with continued effects probable through 15 January. A further CME left the southwest of the Sun on 14 January and may be forecast to affect the Earth during this period once a full analysis has been completed. Outside of CME influence, the solar wind is expected to be at mainly muted levels, but may increase on 17 January due to a connection with a slightly elevated solar wind. Geomagnetic activity is forecast to be mainly Quiet, but with a risk of Active or G1/Minor Storms due to the CME effects.

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux observed by GOES18 is likely to remain at predominantly background levels, but with a chance of enhancements which could produce an S1 proton storm or greater through the period due to a number of magnetically complex sunspot regions on the visible disc.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	80	80	80	70
Very Active	R3 to R5 X	No	20	20	20	15

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	30	40	40	40
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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